

* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to art especially applicable to the refreshable DVD player for playback, the DVD player for recording playback, and these DVD players about an information recording medium, information storage playback equipment, and a method.

[0002]

[Description of the Prior Art] In recent years, the system which plays the optical disc which recorded an image (animation), a sound, etc. is developed, and like LD (laser disc) or a video CD (video compact disc), generally it has spread in order to play movie software, karaoke, etc.

[0003] The MPEG 2 (Moving Image coding Expert Group) method international- standard- ized as compression technology of an animation is adopted, The DVD standard which adopted AC3 audio- compression method as audio coding mode is proposed, the optical disc (a DVD disk is only called hereafter.) based on the standard is already sold, and the playback equipment has also spread.

[0004] The standard of DVD video (DVD- ROM) is supporting AC3 audio and MPEG audio other than linear PCM as MPEG 2 and a voice recording method as animation compression technology according to an MPEG 2 system layer. This DVD video specification adds CDC for reproduction control (navigation data) which carried out run length compression of the bit map data as an object for titles, such as sub picture data and rapid-

traverse rewinding data search, and is constituted. In this standard, ISO9660 and a UDF bridge format are also supported so that data can be read by computer.

[0005] adopting the animation compression technology according to the system layer of MPEG 2 in this DVD standard -- as audio coding mode -- AC3 audio -- or, Support an MPEG audio and it has the sub video image pack which stored independently further the sub picture data which carried out run length compression of the bit map data as an object for titles, It has a data structure provided with the navigation pack which stored independently CDC for special reproduction, such as rapid- traverse rewinding, in a similar manner. In this DVD standard, ISO9660 and micro UDF are supported so that data can be read by computer.

[0006] such a DVD standard is defined as a format only for playback, and can be applied even to the optical disc for recording and refreshable rec/play, and its player in an ordinary home at present -- as -- it is not set. Therefore, it has become clear that the following problems arise that it is going to constitute a rec/play device for home use based on this DVD standard. Usually, after interrupting reproduction for the DVD video playr only for reproduction temporarily during reproduction, it has a continuation regenerative function successingly renewable from the part which interrupted the reproduction. As opposed to the disk with which this continuation regenerative function is specifically inserted, When reproduction is interrupted on the way, a note of the data of the place which pressed once memorizing the information on the place of the part which was being reproduced until now to RAM in a player, and accessing the information on the place, for example, pressing the continuation reproduction key or the play key, and was being reproduced before is made, and it reads from inside.

Then, reproduction is resumed from a continuation of **, or again, the play key is pressed and ordinary reproduction is resumed.

[0007]

[Problem(s) to be Solved by the Invention] In the continuation regenerative function in the DVD video playr only for reproduction which has spread now. When a disk is removed, the playback finish information of the disk disappears, and even if it inserts the same disk again, there is a problem

which can resume playback from the part which interrupted playback for the disk and on which the user himself has to look for a playback part. In the DVD video playr only for reproduction concerning a late model. Even if EE- ROM is used as a memory for preservation of this playback finish information, it has that information for every disk (for example, the playback finish information about a maximum of ten sheets can be saved.) and it is exchanged in a disk, it enables it to search a playback part.

[0008] However, if it adopts, there is a limitation in the capacity of the memory which can be saved and the method which saves playback finish information is indefinitely exchanged in a disk, it will be expected that it becomes impossible to correspond.

[0009] There is a problem which arranges resuming a place to the playback for which playback was interrupted before even if the playback finish information of a disk will disappear if a disk is removed, and it inserts the same disk next time if a user does not search, and says it as inside ** in a DVD player system.

[0010] An object of this invention is to provide the disk, the information storage playback equipment, and the method of continuing, even if it is made in view of the situation mentioned above and is taken out from the playback equipment which can record a disk, and playing.

[0011]

[Means for Solving the Problem] A data area which records a video object built by an audio pack which stored a video pack in which this invention stored a video data, and audio information, and a picture object containing a still picture, In an optical disc which it has, a control information region which records control information which manages data of said video object and a picture object and which it had said video object, Are a set of two or more bidet object units, and to each video object unit. To a packet header which two or more said video packs and audio packs are intermingled, and is contained in said video pack and an audio pack. A presentation time stamp (PTS) is contained and said control information, Including two or more program chain information, each program chain information, Including two or more cell reproduction information, each cell reproduction information, Cell reproduction time- of- onset information for managing reproduction of a cell which corresponds while specifying the reproduction range of said video object unit is included, and reproduction orders of said

video object are managed because said program chain information has relation of cell reproduction information, A program chain which said program chain information shows comprises a program, and further said control information, It contains with a top block for control information of the 1st, and the 2nd block for control information that manages a picture object containing said still picture in the latter part rather than this, A program chain number which manages a portion which is recording a typical picture of said video object on the 1st block for control information of said head is described, For the 1st block for control information of said head. Reproduction interruption information is included and this reproduction interruption information, As information for reproduction of said video object being interrupted and then starting reproduction, A program chain number to specify, number information of said program, information for discernment on a cell, and a hour entry that starts reproduction are included, and are, and for the 1st block for control information of said head. It is based on an optical disc in which search pointer information for searching said program chain information to play is included.

[0012]

[Embodiment of the Invention] Hereafter, with reference to drawings, the digital information recording and reproducing system concerning the 1 embodiment of this invention is explained.

[0013] There is a device which records and reproduces the animation encoded based on MPEG 2 as typical 1 embodiment of the digital information recording and reproducing system concerning this invention with a Variable Bit Rate, for example, a DVD digital video recorder.

[0014] Drawing 1 is a perspective view explaining the structure of the recordable optical disc 10 used for the above- mentioned DVD digital video recorder.

[0015] As shown in drawing 1, this optical disc 10 has the structure which pasted together the transparent substrate 14 of the couple in which the recording layer 17 was formed, respectively by the glue line 20. Each substrate 14 can be constituted from polycarbonate of 0.6- mm thickness, and can constitute the glue line 20 from ultraviolet curing nature resin [being ultra- thin (for example, 40 micrometer thickness)]. As the recording layer 17 contacts on the field of the glue line 20, when it sticks

the 0.6- mm board 14 of these couples, the large volumetric DVD 10 of 1.2- mm thickness is obtained.

[0016] The feed hole 22 is established in the optical disc 10, and the clamping area 24 for clamping this optical disc 10 at the time of rotation is established in the circumference of the feed hole 22 of disk both sides.

When the disk drive device which is not illustrated is loaded with the optical disc 10, the spindle of a disk motor is inserted in the feed hole 22. And the optical disc 10 is clamped during disk rotation in the clamping area 24 by the disk clamper which is not illustrated.

[0017] The optical disc 10 has the information area 25 which can record a video data, audio information, and other information on the circumference of the clamping area 24.

[0018] The read out area 26 is formed in the periphery side among the information area 25. The read in area 27 is formed in the inner circumference side which touches the clamping area 24. And the data recording area 28 is appointed between the read out area 26 and the read in area 27.

[0019] A recording track follows spiral shape and is formed in the recording layer (light reflection layer) 17 of the information area 25. The continuation track is divided into two or more physical sectors, and the sequence number is given to these sectors. Various data is recorded on the optical disc 10 by making this sector into a record unit.

[0020] The data recording area 28 is actual data recording regions, and as record and reproduction information, Audio information, such as sub picture data, such as video datas (main video image data), such as a movie, a title, a menu, and words, a sound effect, is recorded as a pit sequence (the physical shape or the phase change state of resulting in an optical change to a laser reflection).

[0021] When the optical disc 10 is a RAM disk for record / playback, 3 layering which put the phase change recording material layer (for example, germanium₂Sb₂Te₅) can constitute the recording layer 17 from two zinc sulfide and silicon oxide mixtures (ZnS- SiO₂).

[0022] In the read- only DVD- ROM disk 10, reflecting layers, such as metal, will be formed in the field of the substrate 14 in which the pit sequence was beforehand formed in the substrate 14 by the stamper, and this pit sequence was formed, and this reflecting layer will be used as the

recording layer 17. In such a DVD- ROM disk 10, the groove in particular as a recording track is not provided, but the pit sequence formed in the field of the substrate 14 usually functions as a track.

[0023] In various kinds of above- mentioned optical discs 10, the ROM information only for playback is recorded on the recorded information field of the recording layer 17 as an embossing signal. On the other hand, such an embossing signal is not minced by the recorded information field, instead the groove slot of continuation is minced by the substrate 14 which has the recording layer 17 for record / reproduction. A phase change recording layer is provided in this groove slot. In the case of the DVD- RAM disk for record / playback, the phase change recording layer of a land part is also further used for information storage besides a groove.

[0024] The DVD digital video recorder mentioned later is constituted so that the repetitive recording and repeated regeneration (reading and writing) to a DVD- RAM disk (or DVD- RW disk), and the repeated regeneration to a DVD- ROM disk may be possible.

[0025] Drawing 2 is a figure explaining the correspondence relation between the data recording area 28 of the optical disc (DVD- RAM) 10 of drawing 1, and the recording track of the data recorded there.

[0026] When the disk 10 is DVD- RAM (or DVD- RW), in order to protect a delicate disc face, the main part of the disk 10 is stored by the cartridge 11. If the DVD- RAM disk 10 is inserted in the disk drive of the DVD VCR mentioned later the whole cartridge 11, It is clamped by the turntable of the spindle motor which the disk 10 is pulled out and is not illustrated from the cartridge 11, and as the optical head which is not illustrated is faced, it rotates.

[0027] On the other hand, when the disk 10 is DVD- R or DVD- ROM, the main part of the disk 10 is not stored by the cartridge 11, but the directly set of the naked disk 10 is carried out to the disk tray of a disk drive.

[0028] Data recording tracks follow spiral shape and are formed in the recording layer 17 of the information area 25 shown in drawing 1. That continuous track is divided into two or more logical sectors (the minimum record unit) of a fixed storage capacity as shown in drawing 2, and data is recorded on the basis of this logical sector. The storage capacity of one logical sector is decided to be the same 2048 bytes (or 2 K bytes) as 1 packed- data length which mentions later.

[0029] It is actual data recording regions and management data, main video image (video) data, sub picture data, and voice (audio) data are similarly recorded on the data recording area 28.

[0030] Drawing 3 shows the layered structure of the data recorded on the optical disc 10 as an information storage medium in which the rec/play of the video information and music information which are shown in drawing 1 and drawing 2 is possible.

[0031] The data recording area 28 formed in the optical disc 10 shown in drawing 1 and drawing 2 has a layered structure of data as shown in drawing 3. The logical format of this structure is defined based on ISO9660 and the universal disc format (UDF) bridge which are one of the standards, for example.

[0032] As shown in drawing 3, the read in area 27 is formed in the inner circumference side of the optical disc 10, It is provided in the periphery side by the read out area 26, and the data recording area 28 of a before [from the read in area 27 / the read out area 26], It is assigned as the volume space 28 and this volume space 28 has the space (volume / file management area 70) for the information on volume and a file structure, and the space (DVD data area 71) for the application of a DVD standard.

[0033] The read in area 27 has the read- only embossing zone where the light reflection surface carried out uneven shape, the mirror zone formed in the mirror plane where the surface is flat, and a rewriting data zone which can rewrite information. The lead- out field 26 comprises a rewriting data zone which can rewrite information.

[0034] In the embossing data zone of the lead- in groove field 27. Disk types, such as DVD- ROM (read- only DVD disk), DVD- RAM (DVD disk for record reproduction), and DVD- R (added- a postscript type DVD disk), The information about the whole information storage medium, such as a physical sector number which shows disk size, storage density, and a recording start/recording end position, is recorded, Record power and recording pulse width required to record data on the recording layer 17, The information about record, reproduction, and erasing qualities, such as erase power required to eliminate the data recorded on the recording layer 17, reproduction power required to reproduce the data recorded on the recording layer 17, and linear velocity at the time of record and elimination, is recorded. the information concerning [serial number] manufacture of

the information storage medium per sheet respectively in the embossing data zone of the lead- in groove field 27 -- things -- it is recorded in front. In the rewriting data zone 27 of a lead- in groove, and the rewriting data zone of the lead- out 26. The record section for recording the peculiar diskname for every information storage medium, respectively, The trial recording field for a check for checking whether record and elimination are possible on record deletion conditions, It has a management information recording region about the existence of the defect region in the data area 72, and the address of that field, and conditioning for enabling record of the data to the above- mentioned data area 72 is made in this field, and information required for record of subsequent data and elimination row reproduction is recorded.

[0035] The volume space 28 is physically divided into many sectors, and the sequence number is given to those physical sectors. The logical address of the data recorded on this volume space (data recording area) 28 means the logical sector number so that it may be set on ISO9660 and a UDF bridge. A logic sector size here shall be 2048 bytes (2 K bytes) like the valid data size of a physical sector, and, as for the logical sector number, the sequence number is added corresponding to the ascending order of a physical sector number.

[0036] The volume space 28 has a layered structure and includes the data area 72 which consists of a 70 or 1 or more [volume / file management areas] video object. These fields 70 and 72 are classified on the boundary of a logical sector. Here, one logical sector is defined as 2048 bytes, and 1 logical block is also defined as 2048 bytes. Therefore, it is defined as one logical sector being equivalent to 1 logical block.

[0037] Volume / file management area 70 is rewriting data zones in which the record and rewriting by a user are possible, It is equivalent to the management domain provided in ISO9660 and a UDF bridge, and is stored in the system memory (not shown) inside the DVD VCR which the information about the file or entire volume of an audio video data mentions later based on description of this field 70. Usually, this volume / file management area 70 comprise one file.

[0038] As shown in drawing 3 in the data area 72, it is provided in the field in which mixture record of computer data and an audio video is possible. The recording order of computer data and an audio video and each

recorded information size are arbitrary. The field where the field where computer data are recorded was called the computer- data field 74- 1 and 74- 2, and the audio video data was recorded is called an audio and the video data field 76. The computer- data field 74- 1 and 74- 2, When only an audio and a video data are recorded on the record section 72, It does not need to be provided in particular from the character, and similarly, an audio and the video data field 76 do not need to be formed from the character, in particular when only computer data are recorded on the record section 72. The computer- data field 74- 1, 74- 2, an audio, and the video data field 76 comprise 1 or a multi- file, respectively.

[0039] In an audio and the video data field 76. As shown in drawing 3, when performing each processing of recording (sound recording), playback, edit, and search, the video object set 80 which consists of the required control information 78 and a reproduction object, i.e., 1 or two or more video objects 82, 84, and 86 as content, is recorded. the video object 80 and content whose content is a video data at the video object 80 -- still pictures, such as a still slide, -- or, There are the picture object 84 which are picture data in a video data, such as a place, an object for search, or a thumbnail for edit, to see, and the audio object 86 whose contents are audio data. If the video object set 80 comprises at least one of the objects 82, 84, and 86 of these, it is enough and needs to be provided with no objects 82, 84, and 86, so that clearly. The objects 82, 84, and 86 comprise 1 or a multi- file similarly, respectively.

[0040] The video object set 80 which comprises 1 or two or more objects 82, 84, and 86, The video data compressed by the MPEG standard to be shown in drawing 4 (video pack 88 mentioned later), It is compressed by the predetermined standard or incompressible audio information (audio pack 90 mentioned later) and the sub picture data (sub video image pack 92 containing the bit map data in which 1 pixel mentioned later was defined by two or more bits) by which run length compression was carried out are stored. When the video object set 80 comprises the video object 80 so that clearly, When it has a data structure as shown in drawing 4 and the video object set 80 comprises the picture object 84, It has a data structure which does not contain the audio pack 90 and which reaches video pack 88 or comprises only the sub video image pack 92, When the video object set 80 comprises the audio object 86, it will have a data

structure which comprises only the audio pack 90 which does not include the video pack 88 and the sub video image pack 92.

[0041] As shown in drawing 4, the logic top video object set 80, i.e., video, a picture, and the audio objects 82, 84, and 86 comprise two or more cells 94, and each cell 84 is constituted by the one or more video object units (VOBU) 96. Within this cell 84, the video object unit (VOBU) 96 is decoded and reproduced by the array order within that cell 84 in principle. And each video object unit 85, It defines as data which is an aggregate (pack string) of the video pack (V pack) 88, the sub video image pack (SP pack) 92, and the audio pack (A pack) 90, and is reproduced in fixed time, for example, the period for 0.5 to 1.2 seconds. These packs are the minimum units at the time of performing data transfer processing, and data is processed by making a logic top cell into the minimum unit. An identification number (IDN# k;k=0- k) is given to this video object unit (VOBU), and that video object unit 96 can be specified as it with this identification number. During the regeneration phase of this bidet object unit (VOBU) 96, it is equivalent to the regeneration time of the video data which usually comprises one or more image groups (omitting [Glue PUOBU picture;] GOP) contained in the video object unit (VOBU) 85. Usually, by an MPEG standard, 1GOP is usually about 0.5 second, and let it be the picture data compressed to reproduce the frame image of about 15 sheets in the meantime.

[0042] When video object unit VOBU96 contains a video data, GOP (MPEG standard conformity) which comprises the video pack 88, the sub video image pack 90, and the audio pack 91 is arranged, and a video- data stream is constituted. Even if it is in the regenerative data of only an audio and/or sub picture data, the video object unit (VOBU) 96 is made into one unit, and regenerative data is constituted. For example, like the case of the video object VOB of a video data, The audio pack 90 which should be reproduced in the regeneration time of the video object unit (VOBU) 85 to which the audio information belongs is stored in the video object unit (VOBU) 96.

[0043] An identification number (IDN# i;i=0- i) is given to the video objects 82, 84, and 86 which constitute the video object set 80, and those video objects 82, 84, and 86 can be specified as them with this identification number. The identification number (C_IDN# j) is given to each cell 94 like

the case of the video objects 82, 84, and 86.

[0044] Drawing 5 shows the general structure of the video pack 88, the sub video image pack 92, and the audio pack 90. All of these packs comprise data of a 2048- byte unit like the logical sector of drawing 2. Video, an audio, and the sub video image packs 88, 90, and 92 comprise the pack header 98 and the packet 100, as shown in drawing 5. As for the packet 100, the decoding time stamp (DST) and the presentation time stamp (PTS) are recorded on this packet header including the packet header.

[0045] The control information shown in drawing 3, Control information required at the time of reproduction. The management information about the object for place search or the thumbnail for edit in the shown reproduction control information 102, the recording control information 104 which shows control information required at the time of record (recording and sound recording), the edit control information 106 which shows control information required at the time of edit, and a video data to see. The shown thumbnail picture control information 108 grade is included.

[0046] The reproduction control information 102 shown in drawing 3 has the management information table (PLY_MAT) 122, the program chain (PGC) information table (PGCIT) 110, and the reproduction- interruption-information table (PLY_IIT) 124, as shown in drawing 6. Information as information as shown in drawing 7 described, and this program chain (PGC) information table 110 had a data structure as shown in drawing 8 and shown in drawing 9 in the reproduction- interruption- information table 124 is described by the management information table (PLY_MAT) 122.

[0047] As shown in drawing 8, the PGC information table 110 comprises search pointer # 1 to # n114 and PGC information# 1 to # n116 for searching the PGC information management information 112 and each PGC information. The program chain (PGC) information table 110, The information about the reproduction sequence of a program chain (PGC) and a cell is described, According to description of this program chain (PGC) information table 110, the data of the cell 94 recorded on the video object 82, i.e., the movie data as live data which comprise the video object unit 96, is reproduced. This program chain (PGC) information table 110 is constituted from PGC information# n from the PGC information management information 112 and PGC information# 1, and its PGC information (# 1) 116 by the search pointer 114 for searching PGC

information (# n) 116. The reproduction sequence of a cell for PGC which is equivalent to the number of the PGC by referring to the search pointer 114 to be reproduced if the number of PGC is determined is acquired, According to the reproduction sequence of the cell, the data of the cell 94 as live data is gained from the video object 82, and video is played. Here, although the video object 82 was explained, According to description of this program chain (PGC) information table 110 of this, the cell data as live data is similarly taken out and reproduced about the picture object 84 and the audio object 86.

[0048] Here, PGC is equivalent to the chapter in a movie story, and shows the unit which performs a series of reproduction which specified the reproduction sequence of the cell. If it puts in another way and one PGC will be compared to one drama, if two or more cells 94 which constitute this PGC correspond to a scene various [in a drama], they can be interpreted. The contents (or contents of the cell) of this PGC are determined by the software provider who makes the contents recorded, for example on the disk 10. As specifically shown in drawing 10 (a), supposing there is a certain video- data stream, the inside of it will be classified into the video object unit 96 reproduced in a certain fixed time, and a set of the video object unit 96 which continues in principle will be provided in the cell 94.

[0049] Here the video object unit 96, Since it is continuing in principle, it is defined as explaining later cell 94 by PGC information 116, and the first video object unit 96 and the last video object unit 96 which more specifically constitute a cell from the cell reproduction information 120. That is, the information on a reproducing section that the cell reproduction information in the cell reproduction information 120 was specified by the start address and ending address of the regenerative data which constitutes a cell is described.

[0050] When the cell 94 becomes settled, PGC is constituted by defining the reproduction sequence of the cell. For example, PGC# 1 is defined by arranging the three cells 96 on the table of cell reproduction information so that it may be reproduced in order of Theroux A, Theroux B, and Theroux B, as shown in drawing 10 (b). PGC# 2 is defined by arranging the three cells 96 on the table of cell reproduction information so that it may be similarly reproduced in order of Theroux D, Theroux E, and Theroux F, PGC# 3 is

defined by arranging the five cells 96 on the table of cell reproduction information so that it may be reproduced in order of Theroux Q, Theroux R, Theroux S, Theroux T, and Theroux U. Here, PGC# 2 equivalent to the chapter which has the next following PGC# 1 equivalent to a certain chapter is reproduced by making PGC# 1 and # 2 link mutually. If it puts in another way, Theroux F will be continuously reproduced from Theroux A. Although the cell 94 is reproduced by the array order within PGC, Since the method of the composition of PGC and the reproduction sequence of PGC are arbitrary, it becomes possible about various stories creation or to edit from the thing which constitute other PGC(s) for a certain PGC and for which a cell definition can be carried out and the method of a link, i.e., link information, can be defined arbitrarily, for example, and they are **. For example, can link PGC# 3 following PGC# 1 and again, It can be considered as the chapter which adds the same cell G, for example, a cell, to PGC# 1 and PGC# 2, and differs, and arbitrary stories can be reproduced by making PGC# 3 link following PGC# 1 or PGC# 2 by a user's selection.

[0051] As shown in drawing 7, to the reproduction management table 122. Identifier ID of the purport that it is reproduction control information is described, and the start address (VOBS_SA) and ending address (VOBS_EA) of the video object set 80 are described, The ending address (CTLI_EA) of the control information (CTLI) 102 and the ending address (PLYI_EA) of the reproduction control information (PLYI) 102 are described. The attribute (CAT) of the purport that this management information belongs to the format of DVD for record reproduction is described by this reproduction management table 122, The attribute of the video under video object set recorded on the audio video data field 76, For example, the number (AST_Ns) and its attribute of the audio stream under video object set which NTSC system and the attribute of wide ** were described and was recorded similarly, For example, the table (SPST_ATR) which the table (AST_ATR) which described compression technology etc. was described and described the number (SPST_Ns) of the auxiliary video streams under video object set recorded still more nearly similarly, its attribute, etc. is described. When the user is recording the data of menu image data, an animation, or a still picture on the audio video data field 76 as an independent file, When there are no flag (01) and such menu of the

purport that there is an user menu, When the flag (00) of the purport that there is no user menu is described and the reduction image is recorded on the audio video data field 76, the number of PGC which was typical as for the reduction image, and became a basis of the reduction image is described. The flag (0:un-reproducing, 1: finishing [reproduction]) which shows whether reproduction by the user of the video object set by which reproduction control is carried out has finished with a request to print out files and the control information 78 is described.

[0052] As shown in drawing 11, the information which shows the number of PGC(s) is included in the PGC information management information (PGC_MAI) 112 shown in drawing 8, as already stated, the information which points at the head of each PGC information is included in the search pointer 114 of PGC information, and the search of PGC is made easy. PGC information 116 comprises the one or more cell reproduction information 120 shown in the PGC general information 118 and drawing 8 which are shown in drawing 7.

[0053] The PGC information management information 112 (PGC_MAI), As shown in drawing 11, the ending address (PGC_TABLE_EA) of the PGC information table 110, The ending address (PGC_MAI_EA) of the PGC information management information 112 (PGC_MAI), The start address (PGC_SRP_SA) and ending address (PGC_SRP_EA) of the search pointer (PGC_SRP) 114 of PGC information, The start address (PGCI_SA) of all the PGC information (PGCI) 116, an ending address (PGCI_EA), and the number (PGC_Ns) of all the PGC(s) are described.

[0054] The information which shows the regeneration time of PGC and the number of cells as shown in drawing 12 is included in the PGC general information (PGC_GI) 118. Namely, to the PGC general information (PGC_GI) 118. The contents (PGC_CNT) of PGC which described the number of the PGC(s) concerned, and the number of cells, The table (PGC_AST_CTL) where the regeneration time (PGC_PB_TM) of the PGC concerned and the information which controls the audio stream contained in the PGC concerned were described, The table (PGC_SPST_CTL) where the information which controls the auxiliary video stream contained in the PGC concerned was described is described. To the PGC general information (PGC_GI) 118. The link information about PGC which should be linked to the PGC concerned. For example, the PGC navigation control

(PGC_NV_CTL) front PGC, the next PGC, or the jump place (GOup) PGC is described to be, The start address (PGC_PGMAP_SA) of program tables (not shown) with which the list of the programs which constitute the sub video image pallet table (PGC_SP_PLT) and PGC the reproducing information about the color of the palette of a sub video image, etc. is described to be was indicated is described. In this table (PGC_GI), the start address (CELL_PLY_I_SA) of the cell reproduction information (CELL_PLY_I) 120, the flag (those with 01:menu data.) of whether there is any menu data which the user about the PGC concerned created 00: Having no menu data, the flag of whether a request to print out files and reproduction by the user of the PGC concerned were completed (it and) [0- :- sheep-] 1: The flag of whether to wish to continue to save ending with reproduction and the PGC concerned (ARCHIVE Flag), i.e., the flag of whether to wish to preserve permanently, (0: freedom [elimination is possible] 1:permanent preservation) is described.

[0055] or [that the category of a cell (C_CAT) for example, this cell, belongs to a block as shown in drawing 13 at the cell reproduction information (CELL_PLY_I) 120 shown in drawing 8] -- it belongs -- if it becomes, that block will be described for angle iron etc. To the cell reproduction information (CELL_PLY_I) 120. The flag of whether the regeneration time (absolute time) of the cell in the PGC concerned was described, and reproduction by the user of the cell concerned was completed (it and) [0- :- sheep-] 1: The flag of whether to wish to continue to save ending with reproduction and the cell concerned (ARCHIVE Flag), i.e., the flag of whether to wish to preserve permanently, (0: freedom [elimination is possible] 1:permanent preservation) is described. To the cell reproduction information (CELL_PLY_I) 120. The address of the video object unit (VOBU) of the beginning in a cell and the last is described for the start address (CELL_SA) and ending address (CELL_EA) of a cell by the relative address from the head of the video object set 80.

[0056] Here, above- mentioned angle BUBUROKKU means the block which can be changed for the angle. An angle change means changing the angle (camera angle) which looks at an object image. If it says in the example of lock concert video, in the playing scene (the same event) of the same music, it means that the scene from various angles, such as a scene

caught to the vocalist subject, a scene caught to the guitarist subject, and a scene caught to the drummer subject, can be seen.

[0057] As a case where an angle change (or angle change) is made, When angle selection can be performed according to a televiwer's liking, In the flow of a story, automatically, the same scene changes an angle and may be repeated (when a software maker / provider constitutes a story such and the user of; or a DVD VCR performs such edit).

[0058] The reproduction- interruption- information table 124 shown in drawing 6, The reproduction interruption information written in when a user interrupts reproduction is a table described, and in this table 124. The title numbers about the title which interrupted reproduction as shown in drawing 9, the par TOOBU title numbers which interrupted reproduction, The PGC number which interrupted reproduction, the program numbers in PGC which interrupted reproduction, cell ID which interrupted reproduction, all ID of the video object which interrupted reproduction, or its part is recorded at the time of reproduction interruption. Here, a title is equivalent to the concrete title which comprises a video object, and a video object is managed for every title. When a user does two or more division and specifies a part of title (part) in a title, par TOOBU title numbers are attached and the number is recorded as interruption information. When a user is a music fan, a certain singer's program will be recorded, the scene of the special song in it can be specified as a par TOOBU title, and the information about this scene will be recorded as interruption information. In the reproduction- interruption- information table 124, when reproduced images are a still and a still picture, Time for the still to continue and the residual time of the still at the time of reproduction interruption are recorded. The hour entry for time searches which the lapsed time under reproduction of a certain cell is recorded as interruption information, and specifies the time of discontinuation within a video object set (VOBS) or a video object (VOB) in time, The presentation time stamp showing the time when the interrupted video object unit (VOBU) 96 is reproduced (present), The physical sector address on the optical disc which interrupted the address 96 which interrupted playback, for example, a video object unit, (VOBU), and playback, etc. are recorded. In addition, when a row auxiliary video stream is chosen [whether the reproduction- interruption- information table 124 has chosen the audio stream number and auxiliary

video stream at the time of discontinuation, and] (is a sub video image displayed or not?) and the sub video image is being displayed, the auxiliary video stream number at the time of the discontinuation is recorded. The general parameter (from GPRM0 to 15) defined beforehand if needed is described. This general parameter (from GPRM0 to 15) is a parameter of the contents which store the circumstances of the operation which the user performed in a memory and into which operation of a player is made to change based on those circumstances. Anyway, the inner necessary minimum of a showing [the contents described by the reproduction-interruption-information table 124 as interruption information may be added if needed besides the item shown in drawing 9, and] - in drawing 9 paragraph may be recorded. This reproduction-interruption-information table 124 is formed as a file which became independent to the same hierarchy as the reproduction management table 122, as shown in drawing 6, but. It may be provided in the reproduction management table 122, or may be prepared for the hierarchy of a higher rank, for example, the same hierarchy as the reproduction control information 102, and the same hierarchy as the control information 78 rather than the reproduction management table 122.

[0059] The recording control information 104 shown in drawing 6 including the recording table 126 shown in drawing 14 in the recording table 126. The ending address (RECI_EA) of the recording control information 104 and the ending address (REC_MAT_EA) of the recording table 126 are described, and the free space (FREE_SPACE) for writing in the information about recording is provided. The flag of whether to wish to save this whole VOBS in the recording table 126 (ARCHIVE Flag), i.e., the flag of whether to wish to preserve permanently, (0: freedom [elimination is possible] 1:permanent preservation) is described.

[0060] Drawing 15 has illustrated the composition of the device (DVD VCR) which carries out record reproduction of the digital moving image information with a variable recording rate using the information on structure that it explained to the disk of drawing 1 by drawing 3 - drawing 14.

[0061] The device main frame of the DVD VCR shown in drawing 14, The disk drive part (32, 34 grades) which rotates DVD-RAM or the DVD-R disk 10, and performs reading and writing of information to this disk 10 roughly, It comprises the encoder part 50 which constitutes the recording side, the

decoder section 60 which constitutes the playback side, and the microcomputer block 30 which controls operation of a device main frame.

[0062] The encoder part 50 is provided with the following.

ADC(analog- to- digital converter) 52.

Video encoder (V encoder) 53.

Audio encoder (A encoder) 54.

The sub video image encoder (SP encoder) 55, the formatter 56, and the buffer memory 57.

[0063] The external analog video signal + external analog audio signal from the AV input part 42 or the analog TV signal + analog voice signal from the TV tuner 44 is inputted into ADC52. This ADC52 digitizes the inputted analog video signal, for example with the sampling frequency of 13.5 MHz, and the quantifying bit number of 8 bits. (That is, the brightness component Y, the color difference component Cr (or Y- R), and each color difference component Cb (or Y- B) are quantized at 8 bits.) Similarly ADC52, The inputted analog audio signal is digitized, for example with the sampling frequency of 48 kHz, and the quantifying bit number of 16 bits.

[0064] When an analog video signal and a digital audio signal are inputted into ADC52, ADC52 carries out the through pass of the digital audio signal. (The contents of the digital audio signal are good in limping gaits, such as processing which reduces only the jitter which does not change but accompanies a digital signal, or processing which changes a sampling rate and a quantifying bit number).

[0065] On the other hand, when a digital video signal and a digital audio signal are inputted into ADC52, ADC52 carries out the through pass of a digital video signal and the digital audio signal (good [without changing the contents also to the digital signal of these] in limping gaits, such as jitter reduction processing and sampling rate change processing).

[0066] The digital video signal ingredient from ADC52 is sent to the formatter 56 via the video encoder (V encoder) 53. The digital audio signal ingredient from ADC52 is sent to the formatter 56 via the audio encoder (A encoder) 54.

[0067] The V encoder 53 has the function to change the inputted digital video signal into the digital signal compressed with the Variable Bit Rate based on MPEG 2 or MPEG1 standard.

[0068] The A encoder 54 has the function to change the inputted digital audio signal into the digital signal (or digital signal of linear PCM) compressed with the fixed bit rate based on MPEG or an AC- 3 standard.

[0069] When the DVD video signal of a data configuration as shown in drawing 4 and drawing 5 is inputted from the AV input part 42 (for example, signal from the DVD video playr with an independent output terminal of a sub video signal), Or when the DVD video signal of such a data configuration is broadcast and it is received by the TV tuner 44, the sub video signal ingredient (sub video image pack) in a DVD video signal is inputted into the sub video image encoder (SP encoder) 55. The sub picture data inputted into the SP encoder 55 is arranged by predetermined signal aspect, and is sent to the formatter 56.

[0070] The formatter 56, using the buffer memory 57 as a work area. Predetermined signal processing is performed to a video signal, an audio signal, a sub video signal, etc. which were inputted, and the record data corresponding to a format (file structure) which was explained by drawing 3 - drawing 25 is outputted to the data processor 36.

[0071] Here, the standard contents of encoding processing for creating the above- mentioned record data are explained briefly. That is, if encoding processing is started in the encoder part 50 of drawing 15, a required parameter will be set in encoding of video (main video image) data and audio information. Next, the PURIEN code of the main video image data is carried out using the set parameter, and distribution of the optimal code amount for the set- up average transfer rate (recording rate) is calculated. In this way, encoding of a main video image is executed based on the code amount distribution obtained in PURIEN code. At this time, encoding of audio information is also executed simultaneously.

[0072] As a result of a PURIEN code, when a data compression amount is insufficient (when the video program of hope has not been settled in the DVD- RAM disk or DVD- R disk which it is going to record), If it can have an opportunity to carry out a PURIEN code again (if the sauce of recording is sauce in which repeated regeneration, such as videotape or a video disk, is possible), Partial re- encoding of main video image data is executed, and the main video image data of the re- encoded portion is replaced by the main- video- image- data portion which carried out the PURIEN code before it. Main video image data and audio information are encoded by

such a series of processings, and the value of the average bit rate required for record is substantially reduced by them.

[0073] A parameter required to encode sub picture data similarly is set, and the encoded sub picture data is created.

[0074] The main video image data, audio information, and sub picture data which were encoded as mentioned above are put together, and it is changed into the structure of a video object.

[0075] That is, the cell as the minimum unit of main video image data (video data) is set up, and cell reproduction information (C_PLY_I) as shown in drawing 13 is created. Next, the attribute etc. of the composition of the cell which constitutes a program chain (PGC), a main video image, a sub video image, and an audio are set up (a part of attribution information of these.). The reproduction control information 102 including various information explained with reference to drawing 3 and drawing 6 for which the information acquired when encoding each data is used is created.

[0076] The main video image data, audio information, and sub picture data which were encoded are subdivided by the pack of certain size (2048 bytes) as shown in drawing 5. Time stamps, such as PTS (presentation time stamp) and DTS (decoding time stamp), are suitably described by these packs. About PTS of a sub video image, the time arbitrarily delayed from PTS of the main video image data of the same regeneration time belt or audio information can be described.

[0077] And each data cell is defined being collected into VOBU96 as data reproduced in fixed time, and arranging this VOBU96 in order of the time code of each data, so that it may be refreshable, and VOB which comprises two or more cells is constituted. VOBS80 which summarized this VOB one or more is formatted into the structure of drawing 4.

[0078] The disk drive part which performs reading and writing (recording and/or playback) of information to DVD disk 10 is provided with the following.

Disk changer part 110.

Disk drive 32.

Temporary storage part 34.

The data processor 36 and the system time counter (or a system time clock; STC) 38.

[0079] The temporary storage part 34 carries out buffer IRINGU of the part for the constant rate of the data (data outputted from the encoder part 50) written in the disk 10 via the disk drive 32, or, It is used for carrying out buffer IRINGU of the part for the constant rate of the data (data inputted into the decoder section 60) played from the disk 10 via the disk drive 32.

[0080] For example, when the temporary storage part 34 comprises semiconductor memory (DRAM) which is 4 M bytes, the record for about 8 seconds or buffering of regenerative data is possible at the recording rate of an average of 4 Mbps(es). When the temporary storage part 34 comprises an EEPROM (flash memory) which is 16 M bytes, the record for about 30 seconds or buffering of regenerative data is possible at the recording rate of an average of 4 Mbps(es). When the temporary storage part 34 comprises micro HDD (hard disk) which is 100 M bytes, the record for 3 minutes or more or buffering of regenerative data is attained with the recording rate of an average of 4 Mbps(es).

[0081] The temporary storage part 34 can be used for storing temporarily recording information until it is exchanged for a disk with the new disk 10 when the disk 10 has been exhausted in the middle of recording.

[0082] The temporary storage part 34 can be used also for storing temporarily the data usually read by the excess from the drive in fixed time when a high- speed drive (two X or more) is adopted as the disk drive 32. If the read data at the time of reproduction is buffered in the temporary storage part 34, Even when the optical pickup which is not illustrated with an oscillating shock etc. starts a reading error, a reproduced image can be prevented from breaking off by changing and using the regenerative data buffered by the temporary storage part 34.

[0083] According to control of the microcomputer block 30, the data processor 36 of drawing 14, Supply the DVD record data from the encoder part 50 to the disk drive 32, or, Take out the DVD regenerative signal played from the disk 10 from the drive 32, the management information recorded on the disk 10 is rewritten, or the data (a file or VTS) recorded on the disk 10 is deleted.

[0084] The microcomputer block 30 contains ROM in which MPU (or CPU), a control program, etc. were written, and RAM which provides a work area required for program execution.

[0085] MPU of this microcomputer block 30, According to the control

program stored in the ROM, using the RAM as a work area functionally, It operates as it has the reproduction finish information set part 30A which defines reproduction finish information, the reproduction finish information extraction part 30B which takes out reproduction finish information, the reproduction information restart indication part 30C which performs the directions which make reproduction resume by reproduction information, and the reproduction restart spotting part 30D which determines the position which resumes reproduction.

[0086] The contents of which the user of a DVD VCR should be notified among the executed results of MPU30 are displayed on the indicator 48 of a DVD VCR, or are expressed to a monitor display as an onscreen display (OSD).

[0087] The timing by which MPU30 controls the disk changer part 100, the disk drive 32, the data processor 36, the encoder part 50, and/or the decoder section 60, It can perform based on the temporal data from STC38 (although operation of recording and playback is usually performed synchronizing with the time clock from STC38, the other processing may be performed to the timing which became independent of STC38).

[0088] The separator 62 which the decoder section 60 separates each pack from the DVD regenerative data which has pack structure as shown in drawing 5, and is taken out, The memory 63 used at the time of other pack separation and signal- processing execution, and the video decoder (V decoder) 64 which decodes the main video image data separated with the separator 62, The sub video decoder (SP decoder) 65 which decodes the sub picture data (the contents of the sub video image pack 90) separated with the separator 62, The audio decoder (A decoder) 68 which decodes the audio information (the contents of the audio pack 91 of drawing 9) separated with the separator 62, The video processor 66 which compounds suitably the sub picture data from the SP decoder 65 from the V decoder 64 to a video data, and outputs a menu, a highlight button, and a title and other sub video images to a main video image in piles, The video digital- analog converter (V- DAC) 67 which changes the digital video output from the video processor 66 into an analog video signal, It has the audio digital- analog converter (A- DAC) 67 which changes the digital audio output from the A decoder 68 into an analog audio signal.

[0089] The analog video signal from V- DAC67 and the analog audio signal

from A- DAC67 are supplied to the external component (multi- channel stereo unit + monitor TV of two channels - six channels, or projector) which is not illustrated via the AV outputting part 46.

[0090] The data processing operation in the device (DVD VCR) which was mentioned above and which carries out record reproduction, i.e., picture recording processing, and regeneration are explained below.

[0091] At the time of data processing at the time of recording, first, when a user inputs, from the driving part 32, MPU part 30 reads required management data from DVD disk 10, and determines the field to write in as recording command *****. Next, it is set as a management domain write record data in the determined field, the write- in start address of a video data is set as the driving part 32, and the preparations which record data are made.

[0092] Here, the management domain to set up refers to the file management section (directory decoding is pointed out in ISO9660) and the control information 78 which have managed the file, and the parameter required for a file management section is recorded.

[0093] Next, MPU part 32 resets time to STC section 38. Here, STC section 38 performs recording and playback on the basis of this value by the timer of a system. Then, MPU part 30 performs setting out of other each part.

[0094] Here, the flow of a video signal is as follows. Namely, the A/D conversion of the AV signal inputted from the TV tuner part 44 or the external input is first carried out by ADC52, Inputting a video signal into the video encode part 53, an audio signal inputs text signals, such as a closed caption signal or a teletext, into the SP encode part 55 from the audio encode part 54 and the TV tuner part 44, respectively.

[0095] Each decode part compresses and packet- izes each signal (however, it carves and each packet packet- izes so that it may become 2048 bytes per one pack, when it pack- izes.), and inputs it into the formatter section 56. Here, each decoder sections 53, 54, and 55 determine and record PTS of each packet, and DTS if needed according to the value of STC section 38.

[0096] Each packet data which saved packet data to the buffer memory section 57 temporarily, and were inputted into it after that are pack- ized, are mixed for every GOP, and the formatter section 56 inputs them into the D- PRO part 36.

[0097] The D-PRO part 36 is summarized every 16 packs, as an ECC group, attaches ECC and sends it to the driving part 32. However, when the recording preparation to the disk 10 has not done the driving part 32, it transmits to the temporary storage part 34, and record is started in waiting and the ready stage until it is ready for recording data. Here, a bulk memory is assumed in order that the temporary storage part 34 may hold the record data for several minutes or more by rapid access.

[0098] Information required at the time of a recording end, after ending to the reproduction control information 102 and the volume & file management area 70 of the control information 78 is recorded, and recording operation is ended. However, reading and the microcomputer can let pass and write a microcomputer bus to the D-PRO part 36, in order to write the volume & file management area 70 of a file, etc.

[0099] In data processing at the time of reproduction, first, if MPU part 30 receives a reproduction instruction when a user inputs, the address which lets the D-PRO part 36 pass, reads the volume & file management area 70, and is reproduced from the driving part 32 will be determined. A management domain refers to a volume descriptor and a file management section here. It judges whether a disk is a DVD disk by a volume descriptor, the control information 78 is taken out using the information on a file management section, the video objects 82, 84, and 86 equivalent to the title played from the control information 78 are determined, and the address which starts playback is determined.

[0100] MPU part 30 sends the address and read instruction of data by which the point was determined as the driving part 32 next and to reproduce. According to the sent command, from the disk 10, the driving part 32 reads sector data, performs an error correction in the D-PRO part 36, makes it the form of packed data, and is outputted to the decoder section 60.

[0101] In decoder section 60 inside, the separator 62 receives and packetizes the read packed data, and according to the purpose of data video packet data (MPEG video data), Transmitting to the video decoding part 64, the audio packet data 68 is transmitted to the audio decode part 68, and transmits sub video image packet data to the SP decode part 65. Each sent packet data load PTS to an STC section at the time of a transfer start, (MPU part 30 sets PTS in a pack to STC38, or the video decoder part 64

sets PTS of a video data to an STC section automatically.) After that, Each decode part can be regenerated synchronizing with the value of PTS (presentation time stamp) in packet data, comparing the value of PTS and STC, and can reproduce an animation with a voice title to TV.

[0102] Microcomputer operation of reproduction of this patent is explained according to the operation flow shown in drawing 16 and drawing 17. Here, if ordinary reproduction operation has the PLAY key pressed, it will start, but when title numbers are not beforehand specified at this time, the file of the title 1 equivalent to a default, i.e., reproduction of a video object (VOBU), shall be started.

[0103] Rare ** which the control information 78 will read as first shown in Step 12 if Step S10 shown in drawing 16 is started. That is, PGC information 116 shown in drawing 8 in the control information 78 is read into MPU30. if a user specifies a title as shown in Step 14, If the default title 2 is chosen, according to the specified title numbers, each information on the target title will be incorporated and the start address of a video object will be taken out from title search POIN of the PGC information table 110. That is, the PGC number and cell numbers which are reproduced are determined. Initial setting of each decoder is carried out according to the contents written to the reproduction management table of control information as shown in Step S16. As shown in Step 18, the cell reproduced according to the contents of PGCI116 is searched, and a required pretreatment command is executed. This pretreatment command is described by the command table provided in the PGC information table 110 if needed, and is taken out if needed. Then, a cell is reproduced as shown in Step S20. When there is no cell reproduced as shown in Step S22 at a final cell, as shown in Step S24, the following cell numbers are counted up and it shifts to Step S20.

[0104] In Step S22, as shown in Step S26 after waiting and an end till the end of reproduction of a cell, a still is carried out by the still time of a cell. Here, when still time is 0, it shifts to the following step S28 as it is. Then, a post-processing command is executed in Step S28. After this, a processing command is described by the command table provided in the PGC information table 110 if needed like the pretreatment command, and is taken out if needed.

[0105] In Step S30, when there is not the end of reproduction but PGC

which should be reproduced next, the following PGC number is determined and it shifts to Step S18. When it is the end of reproduction, reproduction end processing is performed in Step S32. That is, operation of each decoder being reset and GPRM being reset is performed.

[0106] Next, microcomputer operation of the cell reproduction shown in Steps S20 and S22 of drawing 16 is explained according to the operation flow shown in drawing 17. If the processing at the time of the cell reproduction shown at Step S40 is started, when it will be confirmed whether VOBU is continuing as shown in Step S42 and it will continue, it shifts to Step S48. In Step S42, when the cell is not continuing, in Step 44, a reproduction start address is defined with reference to PGC information 116, and a reproduction start address is set to the driving part 32 with a data read command. The cell reproduction time of onset (C_PBTM) within the control information 78 120, i.e., cell reproduction information, is incorporated into MPU30, and is saved at RAM. This cell reproduction time of onset (C_PBTM) is displayed on a display, and reproduction of a cell is continued based on this regeneration time. As shown in Step S50, when the stop key is pressed during reproduction of a cell, it shifts to Step 60 and reproduction interruption operation is started. That is, reproduction interruption information required for the reproduction- interruption- information table currently prepared as one file shown figure 9 will be written in. Then, as shown in Step S62, cell reproduction is completed based on directions of a reproduction stop.

[0107] It is checked whether when the stop key is not pressed during reproduction of a cell in Step S50, in Step S52, a cell corresponds to a final cell, and when it is not a final cell, it is returned to Step S50. When it is a final cell, to complete reproduction of the last VOBU in the cell, as shown in Step S54 will be waited. After reproduction of the last VOBU is completed, as shown in Step S56, a still is carried out by the still time of a cell, and it shifts to the following step S58. Here, when still time is 0, it shifts to the following step S58 as it is. Since it is a final cell in Step 58, it shifts to Step S26 shown in drawing 16.

[0108] After interrupting cell playback, DVD disk 10 is removed and the processing in the case of loading a DVD recorder with the DVD disk 10 again, continuing, and performing playback after that, is explained with reference to drawing 18.

[0109] When it continues as the continuation reproduction key is pressed and it is shown in Step S70 and playback performs after loading a DVD recorder with DVD disk 10, the reproduction- interruption- information table shown in drawing 9 as first shown in Step S72 is read from a disk. based on the reproduction interruption information of this reproduction- interruption- information table, it is shown in Step S74 -- as -- the playback title at the time of discontinuation, if it puts in another way, While a video object is determined, the register of each part is set based on the information, and the required information in the information is re- stored in RAM of MPU30. Then, the control information 102 is read at Step S76. Here, PGC information 116 is stored in RAM of MPU30. The PGC number reproduced based on the reproduction interruption information of a reproduction- interruption- information table as shown in Step S78, Cell numbers and a VOB number are determined, and as shown in Step S80, based on reproduction interruption information, the video decoder 64, the sub video decoder 65, and the audio decoder 68 are set similarly. As shown in Step S82, it is checked whether the address which resumes reproduction is a head of a cell, a pretreatment command is executed like Step 18 of the ordinary reproduction processing to a being [it / a head of a cell] case, and it shifts to the ordinary reproduction processing shown in drawing 16 from Step S90 after that. That is, processing at the time of cell reproduction is performed like Step S20 of drawing 16. When the address which resumes reproduction is not a head of a cell, as shown in Step S84, PGC information 116 is read, and a reproduction start address is determined. For example, the relative address of VOB is referred to, the relative address is added to the address of VOB of the beginning of the cell, and a reproduction start address is determined. If a reproduction start address is determined, as shown in Step S86, a read- out command will be taken out with the address to the driving part 32, and reproduction will be resumed for the VOB as first VOB like reproduction of the usual cell at Step S90. Same processing is performed as Step 104 having been equivalent to processing also in S34 from Step S22 shown in drawing 16, and already having been explained from Step S92 after this resumption. Therefore, refer to S34 for the detailed explanation from Step S22 drawing 16 is indicated to be.

[0110]

[Effect of the Invention] As explained above, according to this invention, since reproduction interruption information is described by the disk as an information recording medium for recording playback, even if a disk is extracted from a system, playback becomes possible following the recharge back.

[Translation done.] * NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to art especially applicable to the refreshable DVD player for playback, the DVD player for recording playback, and these DVD players about an information recording medium, information storage playback equipment, and a method.

[0002]

[Description of the Prior Art] In recent years, the system which plays the optical disc which recorded an image (animation), a sound, etc. is developed, and like LD (laser disc) or a video CD (video compact disc), generally it has spread in order to play movie software, karaoke, etc.

[0003] The MPEG 2 (Moving Image coding Expert Group) method international- standard- ized as compression technology of an animation is adopted, The DVD standard which adopted AC3 audio- compression method as audio coding mode is proposed, the optical disc (a DVD disk is

only called hereafter.) based on the standard is already sold, and the playback equipment has also spread.

[0004] The standard of DVD video (DVD- ROM) is supporting AC3 audio and MPEG audio other than linear PCM as MPEG 2 and a voice recording method as animation compression technology according to an MPEG 2 system layer. This DVD video specification adds CDC for reproduction control (navigation data) which carried out run length compression of the bit map data as an object for titles, such as sub picture data and rapid-traverse rewinding data search, and is constituted. In this standard, ISO9660 and a UDF bridge format are also supported so that data can be read by computer.

[0005] adopting the animation compression technology according to the system layer of MPEG 2 in this DVD standard -- as audio coding mode -- AC3 audio -- or, Support an MPEG audio and it has the sub video image pack which stored independently further the sub picture data which carried out run length compression of the bit map data as an object for titles, It has a data structure provided with the navigation pack which stored independently CDC for special reproduction, such as rapid- traverse rewinding, in a similar manner. In this DVD standard, ISO9660 and micro UDF are supported so that data can be read by computer.

[0006] such a DVD standard is defined as a format only for playback, and can be applied even to the optical disc for recording and refreshable rec/play, and its player in an ordinary home at present -- as -- it is not set. Therefore, it has become clear that the following problems arise that it is going to constitute a rec/play device for home use based on this DVD standard. Usually, after interrupting reproduction for the DVD video playr only for reproduction temporarily during reproduction, it has a continuation regenerative function successingly renewable from the part which interrupted the reproduction. As opposed to the disk with which this continuation regenerative function is specifically inserted, When reproduction is interrupted on the way, a note of the data of the place which pressed once memorizing the information on the place of the part which was being reproduced until now to RAM in a player, and accessing the information on the place, for example, pressing the continuation reproduction key or the play key, and was being reproduced before is made, and it reads from inside.

Then, reproduction is resumed from a continuation of **, or again, the play key is pressed and ordinary reproduction is resumed.

[0007]

[Problem(s) to be Solved by the Invention] In the continuation regenerative function in the DVD video playr only for reproduction which has spread now. When a disk is removed, the playback finish information of the disk disappears, and even if it inserts the same disk again, there is a problem which can resume playback from the part which interrupted playback for the disk and on which the user himself has to look for a playback part. In the DVD video playr only for reproduction concerning a late model. Even if EE- ROM is used as a memory for preservation of this playback finish information, it has that information for every disk (for example, the playback finish information about a maximum of ten sheets can be saved.) and it is exchanged in a disk, it enables it to search a playback part.

[0008] However, if it adopts, there is a limitation in the capacity of the memory which can be saved and the method which saves playback finish information is indefinitely exchanged in a disk, it will be expected that it becomes impossible to correspond.

[0009] There is a problem which arranges resuming a place to the playback for which playback was interrupted before even if the playback finish information of a disk will disappear if a disk is removed, and it inserts the same disk next time if a user does not search, and says it as inside ** in a DVD player system.

[0010] An object of this invention is to provide the disk, the information storage playback equipment, and the method of continuing, even if it is made in view of the situation mentioned above and is taken out from the playback equipment which can record a disk, and playing.

[0011]

[Means for Solving the Problem] A data area which records a video object which comprised an audio pack which stored a video pack in which this invention stored a video data, and audio information, and a picture object containing a still picture, In an optical disc which it has, a control information region for recording control information which manages data of said video object and a picture object said video object, Are a set of two or more video object units, and to each video object unit. Two or more

said video packs and audio packs are intermingled, and said control information, Including two or more program chain information, each program chain information, Including two or more cell reproduction information, each cell reproduction information, Specify a reproduction range in said video object, and said program chain information manages cell reproduction information 4 reproduction orders, and further said control information, Contain with the 1st block for control information of a head, and the 2nd block for control information that manages a picture object containing a still picture arranged in the latter part rather than this, and for the 1st block for control information of said head. A number of a program chain which manages a portion on which a typical picture of said video object is recorded is described, and further for the 1st block for control information of said head. Reproduction interruption information is included and this reproduction interruption information is based on an optical disc in which a program chain number and information for discernment on a cell to specify are included as information for playback of said video object being interrupted and then starting playback.

[0012]

[Embodiment of the Invention] Hereafter, with reference to drawings, the digital information recording and reproducing system concerning the 1 embodiment of this invention is explained.

[0013] There is a device which records and reproduces the animation encoded based on MPEG 2 as typical 1 embodiment of the digital information recording and reproducing system concerning this invention with a Variable Bit Rate, for example, a DVD digital video recorder.

[0014] Drawing 1 is a perspective view explaining the structure of the recordable optical disc 10 used for the above- mentioned DVD digital video recorder.

[0015] As shown in drawing 1, this optical disc 10 has the structure which pasted together the transparent substrate 14 of the couple in which the recording layer 17 was formed, respectively by the glue line 20. Each substrate 14 can be constituted from polycarbonate of 0.6- mm thickness, and can constitute the glue line 20 from ultraviolet curing nature resin [being ultra- thin (for example, 40 micrometer thickness)]. As the recording layer 17 contacts on the field of the glue line 20, when it sticks the 0.6- mm board 14 of these couples, the large volumetric DVD 10 of

1.2- mm thickness is obtained.

[0016] The feed hole 22 is established in the optical disc 10, and the clamping area 24 for clamping this optical disc 10 at the time of rotation is established in the circumference of the feed hole 22 of disk both sides. When the disk drive device which is not illustrated is loaded with the optical disc 10, the spindle of a disk motor is inserted in the feed hole 22. And the optical disc 10 is clamped during disk rotation in the clamping area 24 by the disk clamper which is not illustrated.

[0017] The optical disc 10 has the information area 25 which can record a video data, audio information, and other information on the circumference of the clamping area 24.

[0018] The read out area 26 is formed in the periphery side among the information area 25. The read in area 27 is formed in the inner circumference side which touches the clamping area 24. And the data recording area 28 is appointed between the read out area 26 and the read in area 27.

[0019] A recording track follows spiral shape and is formed in the recording layer (light reflection layer) 17 of the information area 25. The continuation track is divided into two or more physical sectors, and the sequence number is given to these sectors. Various data is recorded on the optical disc 10 by making this sector into a record unit.

[0020] The data recording area 28 is actual data recording regions, and as record and reproduction information, Audio information, such as sub picture data, such as video datas (main video image data), such as a movie, a title, a menu, and words, a sound effect, is recorded as a pit sequence (the physical shape or the phase change state of resulting in an optical change to a laser reflection).

[0021] When the optical disc 10 is a RAM disk for record / playback, 3 layering which put the phase change recording material layer (for example, germanium2Sb2Te5) can constitute the recording layer 17 from two zinc sulfide and silicon oxide mixtures (ZnS- SiO2).

[0022] In the read- only DVD- ROM disk 10, reflecting layers, such as metal, will be formed in the field of the substrate 14 in which the pit sequence was beforehand formed in the substrate 14 by the stamper, and this pit sequence was formed, and this reflecting layer will be used as the recording layer 17. In such a DVD- ROM disk 10, the groove in particular as

a recording track is not provided, but the pit sequence formed in the field of the substrate 14 usually functions as a track.

[0023] In various kinds of above-mentioned optical discs 10, the ROM information only for playback is recorded on the recorded information field of the recording layer 17 as an embossing signal. On the other hand, such an embossing signal is not minced by the recorded information field, instead the groove slot of continuation is minced by the substrate 14 which has the recording layer 17 for record / reproduction. A phase change recording layer is provided in this groove slot. In the case of the DVD- RAM disk for record / playback, the phase change recording layer of a land part is also further used for information storage besides a groove.

[0024] The DVD digital video recorder mentioned later is constituted so that the repetitive recording and repeated regeneration (reading and writing) to a DVD- RAM disk (or DVD- RW disk), and the repeated regeneration to a DVD- ROM disk may be possible.

[0025] Drawing 2 is a figure explaining the correspondence relation between the data recording area 28 of the optical disc (DVD- RAM) 10 of drawing 1, and the recording track of the data recorded there.

[0026] When the disk 10 is DVD- RAM (or DVD- RW), in order to protect a delicate disc face, the main part of the disk 10 is stored by the cartridge 11. If the DVD- RAM disk 10 is inserted in the disk drive of the DVD VCR mentioned later the whole cartridge 11, It is clamped by the turntable of the spindle motor which the disk 10 is pulled out and is not illustrated from the cartridge 11, and as the optical head which is not illustrated is faced, it rotates.

[0027] On the other hand, when the disk 10 is DVD- R or DVD- ROM, the main part of the disk 10 is not stored by the cartridge 11, but the directly set of the naked disk 10 is carried out to the disk tray of a disk drive.

[0028] Data recording tracks follow spiral shape and are formed in the recording layer 17 of the information area 25 shown in drawing 1. That continuous track is divided into two or more logical sectors (the minimum record unit) of a fixed storage capacity as shown in drawing 2, and data is recorded on the basis of this logical sector. The storage capacity of one logical sector is decided to be the same 2048 bytes (or 2 K bytes) as 1 packed- data length which mentions later.

[0029] It is actual data recording regions and management data, main

video image (video) data, sub picture data, and voice (audio) data are similarly recorded on the data recording area 28.

[0030] Drawing 3 shows the layered structure of the data recorded on the optical disc 10 as an information storage medium in which the rec/play of the video information and music information which are shown in drawing 1 and drawing 2 is possible.

[0031] The data recording area 28 formed in the optical disc 10 shown in drawing 1 and drawing 2 has a layered structure of data as shown in drawing 3. The logical format of this structure is defined based on ISO9660 and the universal disc format (UDF) bridge which are one of the standards, for example.

[0032] As shown in drawing 3, the read in area 27 is formed in the inner circumference side of the optical disc 10, It is provided in the periphery side by the read out area 26, and the data recording area 28 of a before [from the read in area 27 / the read out area 26], It is assigned as the volume space 28 and this volume space 28 has the space (volume / file management area 70) for the information on volume and a file structure, and the space (DVD data area 71) for the application of a DVD standard.

[0033] The read in area 27 has the read- only embossing zone where the light reflection surface carried out uneven shape, the mirror zone formed in the mirror plane where the surface is flat, and a rewriting data zone which can rewrite information. The lead- out field 26 comprises a rewriting data zone which can rewrite information.

[0034] In the embossing data zone of the lead- in groove field 27. Disk types, such as DVD- ROM (read- only DVD disk), DVD- RAM (DVD disk for record reproduction), and DVD- R (added- a postscript type DVD disk), The information about the whole information storage medium, such as a physical sector number which shows disk size, storage density, and a recording start/recording end position, is recorded, Record power and recording pulse width required to record data on the recording layer 17, The information about record, reproduction, and erasing qualities, such as erase power required to eliminate the data recorded on the recording layer 17, reproduction power required to reproduce the data recorded on the recording layer 17, and linear velocity at the time of record and elimination, is recorded. the information concerning [serial number] manufacture of the information storage medium per sheet respectively in the embossing

data zone of the lead- in groove field 27 -- things -- it is recorded in front. In the rewriting data zone 27 of a lead- in groove, and the rewriting data zone of the lead- out 26. The record section for recording the peculiar diskname for every information storage medium, respectively, The trial recording field for a check for checking whether record and elimination are possible on record deletion conditions, It has a management information recording region about the existence of the defect region in the data area 72, and the address of that field, and conditioning for enabling record of the data to the above- mentioned data area 72 is made in this field, and information required for record of subsequent data and elimination row reproduction is recorded.

[0035] The volume space 28 is physically divided into many sectors, and the sequence number is given to those physical sectors. The logical address of the data recorded on this volume space (data recording area) 28 means the logical sector number so that it may be set on ISO9660 and a UDF bridge. A logic sector size here shall be 2048 bytes (2 K bytes) like the valid data size of a physical sector, and, as for the logical sector number, the sequence number is added corresponding to the ascending order of a physical sector number.

[0036] The volume space 28 has a layered structure and includes the data area 72 which consists of a 70 or 1 or more [volume / file management areas] video object. These fields 70 and 72 are classified on the boundary of a logical sector. Here, one logical sector is defined as 2048 bytes, and 1 logical block is also defined as 2048 bytes. Therefore, it is defined as one logical sector being equivalent to 1 logical block.

[0037] Volume / file management area 70 is rewriting data zones in which the record and rewriting by a user are possible, It is equivalent to the management domain provided in ISO9660 and a UDF bridge, and is stored in the system memory (not shown) inside the DVD VCR which the information about the file or entire volume of an audio video data mentions later based on description of this field 70. Usually, this volume / file management area 70 comprise one file.

[0038] As shown in drawing 3 in the data area 72, it is provided in the field in which mixture record of computer data and an audio video is possible. The recording order of computer data and an audio video and each recorded information size are arbitrary, The field where the field where

computer data are recorded was called the computer- data field 74- 1 and 74- 2, and the audio video data was recorded is called an audio and the video data field 76. The computer- data field 74- 1 and 74- 2, When only an audio and a video data are recorded on the record section 72, It does not need to be provided in particular from the character, and similarly, an audio and the video data field 76 do not need to be formed from the character, in particular when only computer data are recorded on the record section 72. The computer- data field 74- 1, 74- 2, an audio, and the video data field 76 comprise 1 or a multi- file, respectively.

[0039] In an audio and the video data field 76. As shown in drawing 3, when performing each processing of recording (sound recording), playback, edit, and search, the video object set 80 which consists of the required control information 78 and a reproduction object, i.e., 1 or two or more video objects 82, 84, and 86 as content, is recorded. the video object 80 and content whose content is a video data at the video object 80 - - still pictures, such as a still slide, - - or, There are the picture object 84 which are picture data in a video data, such as a place, an object for search, or a thumbnail for edit, to see, and the audio object 86 whose contents are audio data. If the video object set 80 comprises at least one of the objects 82, 84, and 86 of these, it is enough and needs to be provided with no objects 82, 84, and 86, so that clearly. The objects 82, 84, and 86 comprise 1 or a multi- file similarly, respectively.

[0040] The video object set 80 which comprises 1 or two or more objects 82, 84, and 86, The video data compressed by the MPEG standard to be shown in drawing 4 (video pack 88 mentioned later), It is compressed by the predetermined standard or incompressible audio information (audio pack 90 mentioned later) and the sub picture data (sub video image pack 92 containing the bit map data in which 1 pixel mentioned later was defined by two or more bits) by which run length compression was carried out are stored. When the video object set 80 comprises the video object 80 so that clearly, When it has a data structure as shown in drawing 4 and the video object set 80 comprises the picture object 84, It has a data structure which does not contain the audio pack 90 and which reaches video pack 88 or comprises only the sub video image pack 92, When the video object set 80 comprises the audio object 86, it will have a data structure which comprises only the audio pack 90 which does not include

the video pack 88 and the sub video image pack 92.

[0041] As shown in drawing 9, the logic top video object set 80, i.e., video, a picture, and the audio objects 82, 84, and 86 comprise two or more cells 94, and each cell 84 is constituted by the one or more video object units (VOBU) 96. Within this cell 84, the video object unit (VOBU) 96 is decoded and reproduced by the array order within that cell 84 in principle. And each video object unit 85, It defines as data which is an aggregate (pack string) of the video pack (V pack) 88, the sub video image pack (SP pack) 92, and the audio pack (A pack) 90, and is reproduced in fixed time, for example, the period for 0.5 to 1.2 seconds. These packs are the minimum units at the time of performing data transfer processing, and data is processed by making a logic top cell into the minimum unit. An identification number (IDN# k;k=0- k) is given to this video object unit (VOBU), and that video object unit 96 can be specified as it with this identification number. During the regeneration phase of this bidet object unit (VOBU) 96, it is equivalent to the regeneration time of the video data which usually comprises one or more image groups (omitting [Glue PUOBU picture;] GOP) contained in the video object unit (VOBU) 85. Usually, by an MPEG standard, 1GOP is usually about 0.5 second, and let it be the picture data compressed to reproduce the frame image of about 15 sheets in the meantime.

[0042] When video object unit VOB96 contains a video data, GOP (MPEG standard conformity) which comprises the video pack 88, the sub video image pack 90, and the audio pack 91 is arranged, and a video- data stream is constituted. Even if it is in the regenerative data of only an audio and/or sub picture data, the video object unit (VOBU) 96 is made into one unit, and regenerative data is constituted. For example, like the case of the video object VOB of a video data, The audio pack 90 which should be reproduced in the regeneration time of the video object unit (VOBU) 85 to which the audio information belongs is stored in the video object unit (VOBU) 96.

[0043] An identification number (IDN# i;i=0- i) is given to the video objects 82, 84, and 86 which constitute the video object set 80, and those video objects 82, 84, and 86 can be specified as them with this identification number. The identification number (C_IDN# j) is given to each cell 94 like the case of the video objects 82, 84, and 86.

[0044] Drawing 5 shows the general structure of the video pack 88, the sub video image pack 92, and the audio pack 90. All of these packs comprise data of a 2048- byte unit like the logical sector of drawing 2. Video, an audio, and the sub video image packs 88, 90, and 92 comprise the pack header 98 and the packet 100, as shown in drawing 5. As for the packet 100, the decoding time stamp (DST) and the presentation time stamp (PTS) are recorded on this packet header including the packet header.

[0045] The control information shown in drawing 3, Control information required at the time of reproduction. The management information about the object for place search or the thumbnail for edit in the shown reproduction control information 102, the recording control information 104 which shows control information required at the time of record (recording and sound recording), the edit control information 106 which shows control information required at the time of edit, and a video data to see. The shown thumbnail picture control information 108 grade is included.

[0046] The reproduction control information 102 shown in drawing 3 has the management information table (PLY_MAT) 122, the program chain (PGC) information table (PGCIT) 110, and the reproduction- interruption-information table (PLY_IIT) 124, as shown in drawing 6. Information as information as shown in drawing 7 described, and this program chain (PGC) information table 110 had a data structure as shown in drawing 8 and shown in drawing 9 in the reproduction- interruption- information table 124 is described by the management information table (PLY_MAT) 122.

[0047] As shown in drawing 8, the PGC information table 110 comprises search pointer # 1 to # n114 and PGC information# 1 to # n116 for searching the PGC information management information 112 and each PGC information. The program chain (PGC) information table 110, The information about the reproduction sequence of a program chain (PGC) and a cell is described, According to description of this program chain (PGC) information table 110, the data of the cell 94 recorded on the video object 82, i.e., the movie data as live data which comprise the video object unit 96, is reproduced. This program chain (PGC) information table 110 is constituted from PGC information# n from the PGC information management information 112 and PGC information# 1, and its PGC information (# 1) 116 by the search pointer 114 for searching PGC information (# n) 116. The reproduction sequence of a cell for PGC which

is equivalent to the number of the PGC by referring to the search pointer 114 to be reproduced if the number of PGC is determined is acquired, According to the reproduction sequence of the cell, the data of the cell 94 as live data is gained from the video object 82, and video is played. Here, although the video object 82 was explained, According to description of this program chain (PGC) information table 110 of this, the cell data as live data is similarly taken out and reproduced about the picture object 84 and the audio object 86.

[0048] Here, PGC is equivalent to the chapter in a movie story, and shows the unit which performs a series of reproduction which specified the reproduction sequence of the cell. If it puts in another way and one PGC will be compared to one drama, if two or more cells 94 which constitute this PGC correspond to a scene various [in a drama], they can be interpreted. The contents (or contents of the cell) of this PGC are determined by the software provider who makes the contents recorded, for example on the disk 10. As specifically shown in drawing 10 (a), supposing there is a certain video- data stream, the inside of it will be classified into the video object unit 96 reproduced in a certain fixed time, and a set of the video object unit 96 which continues in principle will be provided in the cell 94.

[0049] Here the video object unit 96, Since it is continuing in principle, it is defined as explaining later cell 94 by PGC information 116, and the first video object unit 96 and the last video object unit 96 which more specifically constitute a cell from the cell reproduction information 120. That is, the information on a reproducing section that the cell reproduction information in the cell reproduction information 120 was specified by the start address and ending address of the regenerative data which constitutes a cell is described.

[0050] When the cell 94 becomes settled, PGC is constituted by defining the reproduction sequence of the cell. For example, PGC# 1 is defined by arranging the three cells 96 on the table of cell reproduction information so that it may be reproduced in order of Theroux A, Theroux B, and Theroux B, as shown in drawing 10 (b). PGC#2 is defined by arranging the three cells 96 on the table of cell reproduction information so that it may be similarly reproduced in order of Theroux D, Theroux E, and Theroux F, PGC#3 is defined by arranging the five cells 96 on the table of cell reproduction

information so that it may be reproduced in order of Theroux Q, Theroux R, Theroux S, Theroux T, and Theroux U. Here, PGC# 2 equivalent to the chapter which has the next following PGC# 1 equivalent to a certain chapter is reproduced by making PGC# 1 and # 2 link mutually. If it puts in another way, Theroux F will be continuously reproduced from Theroux A. Although the cell 94 is reproduced by the array order within PGC, Since the method of the composition of PGC and the reproduction sequence of PGC are arbitrary, it becomes possible about various stories creation or to edit from the thing which constitute other PGC(s) for a certain PGC and for which a cell definition can be carried out and the method of a link, i.e., link information, can be defined arbitrarily, for example, and they are **. For example, can link PGC# 3 following PGC# 1 and again, It can be considered as the chapter which adds the same cell G, for example, a cell, to PGC# 1 and PGC# 2, and differs, and arbitrary stories can be reproduced by making PGC# 3 link following PGC# 1 or PGC# 2 by a user's selection.

[0051] As shown in drawing 7, to the reproduction management table 122. Identifier ID of the purport that it is reproduction control information is described, and the start address (VOBS_SA) and ending address (VOBS_EA) of the video object set 80 are described, The ending address (CTLI_EA) of the control information (CTLI) 102 and the ending address (PLYI_EA) of the reproduction control information (PLYI) 102 are described. The attribute (CAT) of the purport that this management information belongs to the format of DVD for record reproduction is described by this reproduction management table 122, The attribute of the video under video object set recorded on the audio video data field 76, For example, the number (AST_Ns) and its attribute of the audio stream under video object set which NTSC system and the attribute of wide ** were described and was recorded similarly, For example, the table (SPST_ATR) which the table (AST_ATR) which described compression technology etc. was described and described the number (SPST_Ns) of the auxiliary video streams under video object set recorded still more nearly similarly, its attribute, etc. is described. When the user is recording the data of menu image data, an animation, or a still picture on the audio video data field 76 as an independent file, When there are no flag (01) and such menu of the purport that there is an user menu, When the flag (00) of the purport that

there is no user menu is described and the reduction image is recorded on the audio video data field 76, the number of PGC which was typical as for the reduction image, and became a basis of the reduction image is described. The flag (0:un-reproducing, 1: finishing [reproduction]) which shows whether reproduction by the user of the video object set by which reproduction control is carried out has finished with a request to print out files and the control information 78 is described.

[0052] As shown in drawing 11, the information which shows the number of PGC(s) is included in the PGC information management information (PGC_MAI) 112 shown in drawing 8, as already stated, the information which points at the head of each PGC information is included in the search pointer 114 of PGC information, and the search of PGC is made easy. PGC information 116 comprises the one or more cell reproduction information 120 shown in the PGC general information 118 and drawing 8 which are shown in drawing 7.

[0053] The PGC information management information 112 (PGC_MAI), As shown in drawing 11, the ending address (PGC_TABLE_EA) of the PGC information table 110, The ending address (PGC_MAI_EA) of the PGC information management information 112 (PGC_MAI), The start address (PGC_SRP_SA) and ending address (PGC_SRP_EA) of the search pointer (PGC_SRP) 114 of PGC information, The start address (PGCI_SA) of all the PGC information (PGCI) 116, an ending address (PGCI_EA), and the number (PGC_Ns) of all the PGC(s) are described.

[0054] The information which shows the regeneration time of PGC and the number of cells as shown in drawing 12 is included in the PGC general information (PGC_GI) 118. Namely, to the PGC general information (PGC_GI) 118. The contents (PGC_CNT) of PGC which described the number of the PGC(s) concerned, and the number of cells, The table (PGC_AST_CTL) where the regeneration time (PGC_PB_TM) of the PGC concerned and the information which controls the audio stream contained in the PGC concerned were described, The table (PGC_SPST_CTL) where the information which controls the auxiliary video stream contained in the PGC concerned was described is described. To the PGC general information (PGC_GI) 118. The link information about PGC which should be linked to the PGC concerned. For example, the PGC navigation control (PGC_NV_CTL) front PGC, the next PGC, or the jump place (GOup) PGC is

described to be, The start address (PGC_PGMAP_SA) of program tables (not shown) with which the list of the programs which constitute the sub video image pallet table (PGC_SP_PLT) and PGC the reproducing information about the color of the palette of a sub video image, etc. is described to be was indicated is described. In this table (PGC_GI), the start address (CELL_PLY_I_SA) of the cell reproduction information (CELL_PLY_I) 120, the flag (those with 01:menu data.) of whether there is any menu data which the user about the PGC concerned created 00: Having no menu data, the flag of whether a request to print out files and reproduction by the user of the PGC concerned were completed (it and) [0- :- sheep-] 1: The flag of whether to wish to continue to save ending with reproduction and the PGC concerned (ARCHIVE Flag), i.e., the flag of whether to wish to preserve permanently, (0: freedom [elimination is possible] 1:permanent preservation) is described.

[0055] or [that the category of a cell (C_CAT) for example, this cell, belongs to a block as shown in drawing 13 at the cell reproduction information (CELL_PLY_I) 120 shown in drawing 8] -- it belongs -- if it becomes, that block will be described for angle iron etc. To the cell reproduction information (CELL_PLY_I) 120. The flag of whether the regeneration time (absolute time) of the cell in the PGC concerned was described, and reproduction by the user of the cell concerned was completed (it and) [0- :- sheep-] 1: The flag of whether to wish to continue to save ending with reproduction and the cell concerned (ARCHIVE Flag), i.e., the flag of whether to wish to preserve permanently, (0: freedom [elimination is possible] 1:permanent preservation) is described. To the cell reproduction information (CELL_PLY_I) 120. The address of the video object unit (VOBU) of the beginning in a cell and the last is described for the start address (CELL_SA) and ending address (CELL_EA) of a cell by the relative address from the head of the video object set 80.

[0056] Here, above- mentioned angle BUBUROKKU means the block which can be changed for the angle. An angle change means changing the angle (camera angle) which looks at an object image. If it says in the example of lock concert video, in the playing scene (the same event) of the same music, it means that the scene from various angles, such as a scene caught to the vocalist subject, a scene caught to the guitarist subject, and

a scene caught to the drummer subject, can be seen.

[0057] As a case where an angle change (or angle change) is made, When angle selection can be performed according to a televiwer's liking, In the flow of a story, automatically, the same scene changes an angle and may be repeated (when a software maker / provider constitutes a story such and the user of; or a DVD VCR performs such edit).

[0058] The reproduction- interruption- information table 124 shown in drawing 6, The reproduction interruption information written in when a user interrupts reproduction is a table described, and in this table 124. The title numbers about the title which interrupted reproduction as shown in drawing 9, the par TOOBU title numbers which interrupted reproduction, The PGC number which interrupted reproduction, the program numbers in PGC which interrupted reproduction, cell ID which interrupted reproduction, all ID of the video object which interrupted reproduction, or its part is recorded at the time of reproduction interruption. Here, a title is equivalent to the concrete title which comprises a video object, and a video object is managed for every title. When a user does two or more division and specifies a part of title (part) in a title, par TOOBU title numbers are attached and the number is recorded as interruption information. When a user is a music fan, a certain singer's program will be recorded, the scene of the special song in it can be specified as a par TOOBU title, and the information about this scene will be recorded as interruption information. In the reproduction- interruption- information table 124, when reproduced images are a still and a still picture, Time for the still to continue and the residual time of the still at the time of reproduction interruption are recorded, The hour entry for time searches which the lapsed time under reproduction of a certain cell is recorded as interruption information, and specifies the time of discontinuation within a video object set (VOBS) or a video object (VOB) in time, The presentation time stamp showing the time when the interrupted video object unit (VOBU) 96 is reproduced (present), The physical sector address on the optical disc which interrupted the address 96 which interrupted playback, for example, a video object unit, (VOBU), and playback, etc. are recorded. In addition, when a row auxilliary video stream is chosen [whether the reproduction- interruption- information table 124 has chosen the audio stream number and auxiliary video stream at the time of discontinuation, and] (is a sub video image

displayed or not?) and the sub video image is being displayed, the auxiliary video stream number at the time of the discontinuation is recorded. The general parameter (from GPRM0 to 15) defined beforehand if needed is described. This general parameter (from GPRM0 to 15) is a parameter of the contents which store the circumstances of the operation which the user performed in a memory and into which operation of a player is made to change based on those circumstances. Anyway, the inner necessary minimum of a showing [the contents described by the reproduction-interruption-information table 124 as interruption information may be added if needed besides the item shown in drawing 9, and] - in drawing 9 paragraph may be recorded. This reproduction- interruption- information table 124 is formed as a file which became independent to the same hierarchy as the reproduction management table 122, as shown in drawing 6, but. It may be provided in the reproduction management table 122, or may be prepared for the hierarchy of a higher rank, for example, the same hierarchy as the reproduction control information 102, and the same hierarchy as the control information 78 rather than the reproduction management table 122.

[0059] The recording control information 104 shown in drawing 6 including the recording table 126 shown in drawing 14 in the recording table 126. The ending address (RECI_EA) of the recording control information 104 and the ending address (REC_MAT_EA) of the recording table 126 are described, and the free space (FREE_SPACE) for writing in the information about recording is provided. The flag of whether to wish to save this whole VOBS in the recording table 126 (ARCHIVE Flag), i.e., the flag of whether to wish to preserve permanently, (0: freedom [elimination is possible] 1:permanent preservation) is described.

[0060] Drawing 15 has illustrated the composition of the device (DVD VCR) which carries out record reproduction of the digital moving image information with a variable recording rate using the information on structure that it explained to the disk of drawing 1 by drawing 3 - drawing 14.

[0061] The device main frame of the DVD VCR shown in drawing 14, The disk drive part (32, 34 grades) which rotates DVD- RAM or the DVD- R disk 10, and performs reading and writing of information to this disk 10 roughly, It comprises the encoder part 50 which constitutes the recording side, the decoder section 60 which constitutes the playback side, and the

microcomputer block 30 which controls operation of a device main frame.

[0062] The encoder part 50 is provided with the following.

ADC(analog- to- digital converter) 52.

Video encoder (V encoder) 53.

Audio encoder (A encoder) 54.

The sub video image encoder (SP encoder) 55, the formatter 56, and the buffer memory 57.

[0063] The external analog video signal + external analog audio signal from the AV input part 42 or the analog TV signal + analog voice signal from the TV tuner 44 is inputted into ADC52. This ADC52 digitizes the inputted analog video signal, for example with the sampling frequency of 13.5 MHz, and the quantifying bit number of 8 bits. (That is, the brightness component Y, the color difference component Cr (or Y- R), and each color difference component Cb (or Y- B) are quantized at 8 bits.) Similarly ADC52, The inputted analog audio signal is digitized, for example with the sampling frequency of 48 kHz, and the quantifying bit number of 16 bits.

[0064] When an analog video signal and a digital audio signal are inputted into ADC52, ADC52 carries out the through pass of the digital audio signal. (The contents of the digital audio signal are good in limping gaits, such as processing which reduces only the jitter which does not change but accompanies a digital signal, or processing which changes a sampling rate and a quantifying bit number).

[0065] On the other hand, when a digital video signal and a digital audio signal are inputted into ADC52, ADC52 carries out the through pass of a digital video signal and the digital audio signal (good [without changing the contents also to the digital signal of these] in limping gaits, such as jitter reduction processing and sampling rate change processing).

[0066] The digital video signal ingredient from ADC52 is sent to the formatter 56 via the video encoder (V encoder) 53. The digital audio signal ingredient from ADC52 is sent to the formatter 56 via the audio encoder (A encoder) 54.

[0067] The V encoder 53 has the function to change the inputted digital video signal into the digital signal compressed with the Variable Bit Rate based on MPEG 2 or MPEG1 standard.

[0068] The A encoder 54 has the function to change the inputted digital

audio signal into the digital signal (or digital signal of linear PCM) compressed with the fixed bit rate based on MPEG or an AC- 3 standard.

[0069] When the DVD video signal of a data configuration as shown in drawing 4 and drawing 5 is inputted from the AV input part 42 (for example, signal from the DVD video play with an independent output terminal of a sub video signal), Or when the DVD video signal of such a data configuration is broadcast and it is received by the TV tuner 44, the sub video signal ingredient (sub video image pack) in a DVD video signal is inputted into the sub video image encoder (SP encoder) 55. The sub picture data inputted into the SP encoder 55 is arranged by predetermined signal aspect, and is sent to the formatter 56.

[0070] The formatter 56, using the buffer memory 57 as a work area. Predetermined signal processing is performed to a video signal, an audio signal, a sub video signal, etc. which were inputted, and the record data corresponding to a format (file structure) which was explained by drawing 3 - drawing 25 is outputted to the data processor 36.

[0071] Here, the standard contents of encoding processing for creating the above- mentioned record data are explained briefly. That is, if encoding processing is started in the encoder part 50 of drawing 15, a required parameter will be set in encoding of video (main video image) data and audio information. Next, the PURIEN code of the main video image data is carried out using the set parameter, and distribution of the optimal code amount for the set- up average transfer rate (recording rate) is calculated. In this way, encoding of a main video image is executed based on the code amount distribution obtained in PURIEN code. At this time, encoding of audio information is also executed simultaneously.

[0072] As a result of a PURIEN code, when a data compression amount is insufficient (when the video program of hope has not been settled in the DVD- RAM disk or DVD- R disk which it is going to record), If it can have an opportunity to carry out a PURIEN code again (if the source of recording is source in which repeated regeneration, such as videotape or a video disk, is possible), Partial re- encoding of main video image data is executed, and the main video image data of the re- encoded portion is replaced by the main- video- image- data portion which carried out the PURIEN code before it. Main video image data and audio information are encoded by such a series of processings, and the value of the average bit rate required

for record is substantially reduced by them.

[0073] A parameter required to encode sub picture data similarly is set, and the encoded sub picture data is created.

[0074] The main video image data, audio information, and sub picture data which were encoded as mentioned above are put together, and it is changed into the structure of a video object.

[0075] That is, the cell as the minimum unit of main video image data (video data) is set up, and cell reproduction information (C_PLY_I) as shown in drawing 13 is created. Next, the attribute etc. of the composition of the cell which constitutes a program chain (PGC), a main video image, a sub video image, and an audio are set up (a part of attribution information of these.). The reproduction control information 102 including various information explained with reference to drawing 3 and drawing 6 for which the information acquired when encoding each data is used is created.

[0076] The main video image data, audio information, and sub picture data which were encoded are subdivided by the pack of certain size (2048 bytes) as shown in drawing 5. Time stamps, such as PTS (presentation time stamp) and DTS (decoding time stamp), are suitably described by these packs. About PTS of a sub video image, the time arbitrarily delayed from PTS of the main video image data of the same regeneration time belt or audio information can be described.

[0077] And each data cell is defined being collected into VOB96 as data reproduced in fixed time, and arranging this VOB96 in order of the time code of each data, so that it may be refreshable, and VOB which comprises two or more cells is constituted. VOB80 which summarized this VOB one or more is formatted into the structure of drawing 4.

[0078] The disk drive part which performs reading and writing (recording and/or playback) of information to DVD disk 10 is provided with the following.

Disk changer part 110.

Disk drive 32.

Temporary storage part 34.

The data processor 36 and the system time counter (or a system time clock; STC) 38.

[0079] The temporary storage part 34 carries out buffer IRINGU of the part

for the constant rate of the data (data outputted from the encoder part 50) written in the disk 10 via the disk drive 32, or, It is used for carrying out buffer IRINGU of the part for the constant rate of the data (data inputted into the decoder section 60) played from the disk 10 via the disk drive 32.

[0080] For example, when the temporary storage part 34 comprises semiconductor memory (DRAM) which is 4 M bytes, the record for about 8 seconds or buffering of regenerative data is possible at the recording rate of an average of 4 Mbps(es). When the temporary storage part 34 comprises an EEPROM (flash memory) which is 16 M bytes, the record for about 30 seconds or buffering of regenerative data is possible at the recording rate of an average of 4 Mbps(es). When the temporary storage part 34 comprises micro HDD (hard disk) which is 100 M bytes, the record for 3 minutes or more or buffering of regenerative data is attained with the recording rate of an average of 4 Mbps(es).

[0081] The temporary storage part 34 can be used for storing temporarily recording information until it is exchanged for a disk with the new disk 10 when the disk 10 has been exhausted in the middle of recording.

[0082] The temporary storage part 34 can be used also for storing temporarily the data usually read by the excess from the drive in fixed time when a high- speed drive (two X or more) is adopted as the disk drive 32. If the read data at the time of reproduction is buffered in the temporary storage part 34, Even when the optical pickup which is not illustrated with an oscillating shock etc. starts a reading error, a reproduced image can be prevented from breaking off by changing and using the regenerative data buffered by the temporary storage part 34.

[0083] According to control of the microcomputer block 30, the data processor 36 of drawing 14, Supply the DVD record data from the encoder part 50 to the disk drive 32, or, Take out the DVD regenerative signal played from the disk 10 from the drive 32, the management information recorded on the disk 10 is rewritten, or the data (a file or VTS) recorded on the disk 10 is deleted.

[0084] The microcomputer block 30 contains ROM in which MPU (or CPU), a control program, etc. were written, and RAM which provides a work area required for program execution.

[0085] MPU of this microcomputer block 30, According to the control program stored in the ROM, using the RAM as a work area functionally, It

operates as it has the reproduction finish information set part 30A which defines reproduction finish information, the reproduction finish information extraction part 30B which takes out reproduction finish information, the reproduction information restart indication part 30C which performs the directions which make reproduction resume by reproduction information, and the reproduction restart spotting part 30D which determines the position which resumes reproduction.

[0086] The contents of which the user of a DVD VCR should be notified among the executed results of MPU30 are displayed on the indicator 48 of a DVD VCR, or are expressed to a monitor display as an onscreen display (OSD).

[0087] The timing by which MPU30 controls the disk changer part 100, the disk drive 32, the data processor 36, the encoder part 50, and/or the decoder section 60, It can perform based on the temporal data from STC38 (although operation of recording and playback is usually performed synchronizing with the time clock from STC38, the other processing may be performed to the timing which became independent of STC38).

[0088] The separator 62 which the decoder section 60 separates each pack from the DVD regenerative data which has pack structure as shown in drawing 5, and is taken out, The memory 63 used at the time of other pack separation and signal- processing execution, and the video decoder (V decoder) 64 which decodes the main video image data separated with the separator 62, The sub video decoder (SP decoder) 65 which decodes the sub picture data (the contents of the sub video image pack 90) separated with the separator 62, The audio decoder (A decoder) 68 which decodes the audio information (the contents of the audio pack 91 of drawing 9) separated with the separator 62, The video processor 66 which compounds suitably the sub picture data from the SP decoder 65 from the V decoder 64 to a video data, and outputs a menu, a highlight button, and a title and other sub video images to a main video image in piles, The video digital- analog converter (V- DAC) 67 which changes the digital video output from the video processor 66 into an analog video signal, It has the audio digital- analog converter (A- DAC) 67 which changes the digital audio output from the A decoder 68 into an analog audio signal.

[0089] The analog video signal from V- DAC67 and the analog audio signal from A- DAC67 are supplied to the external component (multi- channel

stereo unit + monitor TV of two channels - six channels, or projector) which is not illustrated via the AV outputting part 46.

[0090] The data processing operation in the device (DVD VCR) which was mentioned above and which carries out record reproduction, i.e., picture recording processing, and regeneration are explained below.

[0091] At the time of data processing at the time of recording, first, when a user inputs, from the driving part 32, MPU part 30 reads required management data from DVD disk 10, and determines the field to write in as recording command *****. Next, it is set as a management domain write record data in the determined field, the write- in start address of a video data is set as the driving part 32, and the preparations which record data are made.

[0092] Here, the management domain to set up refers to the file management section (directory decoding is pointed out in ISO9660) and the control information 78 which have managed the file, and the parameter required for a file management section is recorded.

[0093] Next, MPU part 32 resets time to STC section 38. Here, STC section 38 performs recording and playback on the basis of this value by the timer of a system. Then, MPU part 30 performs setting out of other each part.

[0094] Here, the flow of a video signal is as follows. Namely, the A/D conversion of the AV signal inputted from the TV tuner part 44 or the external input is first carried out by ADC52, Inputting a video signal into the video encode part 53, an audio signal inputs text signals, such as a closed caption signal or a teletext, into the SP encode part 55 from the audio encode part 54 and the TV tuner part 44, respectively.

[0095] Each decode part compresses and packet- izes each signal (however, it carves and each packet packet- izes so that it may become 2048 bytes per one pack, when it pack- izes.), and inputs it into the formatter section 56. Here, each decoder sections 53, 54, and 55 determine and record PTS of each packet, and DTS if needed according to the value of STC section 38.

[0096] Each packet data which saved packet data to the buffer memory section 57 temporarily, and were inputted into it after that are pack- ized, are mixed for every GOP, and the formatter section 56 inputs them into the D- PRO part 36.

[0097] The D- PRO part 36 is summarized every 16 packs, as an ECC

group, attaches ECC and sends it to the driving part 32. However, when the recording preparation to the disk 10 has not done the driving part 32, it transmits to the temporary storage part 34, and record is started in waiting and the ready stage until it is ready for recording data. Here, a bulk memory is assumed in order that the temporary storage part 34 may hold the record data for several minutes or more by rapid access.

[0098] Information required at the time of a recording end, after ending to the reproduction control information 102 and the volume & file management area 70 of the control information 78 is recorded, and recording operation is ended. However, reading and the microcomputer can let pass and write a microcomputer bus to the D- PRO part 36, in order to write the volume & file management area 70 of a file, etc.

[0099] In data processing at the time of reproduction, first, if MPU part 30 receives a reproduction instruction when a user inputs, the address which lets the D- PRO part 36 pass, reads the volume & file management area 70, and is reproduced from the driving part 32 will be determined. A management domain refers to a volume descriptor and a file management section here, It judges whether a disk is a DVD disk by a volume descriptor, the control information 78 is taken out using the information on a file management section, the video objects 82, 84, and 86 equivalent to the title played from the control information 78 are determined, and the address which starts playback is determined.

[0100] MPU part 30 sends the address and read instruction of data by which the point was determined as the driving part 32 next and to reproduce. According to the sent command, from the disk 10, the driving part 32 reads sector data, performs an error correction in the D- PRO part 36, makes it the form of packed data, and is outputted to the decoder section 60.

[0101] In decoder section 60 inside, the separator 62 receives and packetizes the read packed data, and according to the purpose of data video packet data (MPEG video data), Transmitting to the video decoding part 64, the audio packet data 68 is transmitted to the audio decode part 68, and transmits sub video image packet data to the SP decode part 65. Each sent packet data load PTS to an STC section at the time of a transfer start, (MPU part 30 sets PTS in a pack to STC38, or the video decoder part 64 sets PTS of a video data to an STC section automatically.) After that, Each

decode part can be regenerated synchronizing with the value of PTS (presentation time stamp) in packet data, comparing the value of PTS and STC, and can reproduce an animation with a voice title to TV.

[0102] Microcomputer operation of reproduction of this patent is explained according to the operation flow shown in drawing 16 and drawing 17. Here, if ordinary reproduction operation has the PLAY key pressed, it will start, but when title numbers are not beforehand specified at this time, the file of the title 1 equivalent to a default, i.e., reproduction of a video object (VOBU), shall be started.

[0103] Rare ** which the control information 78 will read as first shown in Step 12 if Step S10 shown in drawing 16 is started. That is, PGC information 116 shown in drawing 8 in the control information 78 is read into MPU30. if a user specifies a title as shown in Step 14, If the default title 2 is chosen, according to the specified title numbers, each information on the target title will be incorporated and the start address of a video object will be taken out from title search POIN of the PGC information table 110. That is, the PGC number and cell numbers which are reproduced are determined. Initial setting of each decoder is carried out according to the contents written to the reproduction management table of control information as shown in Step S16. As shown in Step 18, the cell reproduced according to the contents of PGCI116 is searched, and a required pretreatment command is executed. This pretreatment command is described by the command table provided in the PGC information table 110 if needed, and is taken out if needed. Then, a cell is reproduced as shown in Step S20. When there is no cell reproduced as shown in Step S22 at a final cell, as shown in Step S24, the following cell numbers are counted up and it shifts to Step S20.

[0104] In Step S22, as shown in Step S26 after waiting and an end till the end of reproduction of a cell, a still is carried out by the still time of a cell. Here, when still time is 0, it shifts to the following step S28 as it is. Then, a post-processing command is executed in Step S28. After this, a processing command is described by the command table provided in the PGC information table 110 if needed like the pretreatment command, and is taken out if needed.

[0105] In Step S30, when there is not the end of reproduction but PGC which should be reproduced next, the following PGC number is determined

and it shifts to Step S18. When it is the end of reproduction, reproduction end processing is performed in Step S32. That is, operation of each decoder being reset and GPRM being reset is performed.

[0106] Next, microcomputer operation of the cell reproduction shown in Steps S20 and S22 of drawing 16 is explained according to the operation flow shown in drawing 17. If the processing at the time of the cell reproduction shown at Step S40 is started, when it will be confirmed whether VOBU is continuing as shown in Step S42 and it will continue, it shifts to Step S48. In Step S42, when the cell is not continuing, in Step 44, a reproduction start address is defined with reference to PGC information 116, and a reproduction start address is set to the driving part 32 with a data read command. The cell reproduction time of onset (C_PBTM) within the control information 78 120, i.e., cell reproduction information, is incorporated into MPU30, and is saved at RAM. This cell reproduction time of onset (C_PBTM) is displayed on a display, and reproduction of a cell is continued based on this regeneration time. As shown in Step S50, when the stop key is pressed during reproduction of a cell, it shifts to Step 60 and reproduction interruption operation is started. That is, reproduction interruption information required for the reproduction- interruption-information table currently prepared as one file shown figure 9 will be written in. Then, as shown in Step S62, cell reproduction is completed based on directions of a reproduction stop.

[0107] It is checked whether when the stop key is not pressed during reproduction of a cell in Step S50, in Step S52, a cell corresponds to a final cell, and when it is not a final cell, it is returned to Step S50. When it is a final cell, to complete reproduction of the last VOBU in the cell, as shown in Step S54 will be waited. After reproduction of the last VOBU is completed, as shown in Step S56, a still is carried out by the still time of a cell, and it shifts to the following step S58. Here, when still time is 0, it shifts to the following step S58 as it is. Since it is a final cell in Step 58, it shifts to Step S26 shown in drawing 16.

[0108] After interrupting cell playback, DVD disk 10 is removed and the processing in the case of loading a DVD recorder with the DVD disk 10 again, continuing, and performing playback after that, is explained with reference to drawing 18.

[0109] When it continues as the continuation reproduction key is pressed

and it is shown in Step S70 and playback performs after loading a DVD recorder with DVD disk 10, the reproduction- interruption- information table shown in drawing 9 as first shown in Step S72 is read from a disk. based on the reproduction interruption information of this reproduction- interruption- information table, it is shown in Step S74 -- as -- the playback title at the time of discontinuation, if it puts in another way, While a video object is determined, the register of each part is set based on the information, and the required information in the information is re- stored in RAM of MPU30. Then, the control information 102 is read at Step S76.

Here, PGC information 116 is stored in RAM of MPU30. The PGC number reproduced based on the reproduction interruption information of a reproduction- interruption- information table as shown in Step S78, Cell numbers and a VOBU number are determined, and as shown in Step S80, based on reproduction interruption information, the video decoder 64, the sub video decoder 65, and the audio decoder 68 are set similarly. As shown in Step S82, it is checked whether the address which resumes reproduction is a head of a cell, a pretreatment command is executed like Step 18 of the ordinary reproduction processing to a being [it / a head of a cell] case, and it shifts to the ordinary reproduction processing shown in drawing 16 from Step S90 after that. That is, processing at the time of cell reproduction is performed like Step S20 of drawing 16. When the address which resumes reproduction is not a head of a cell, as shown in Step S84, PGC information 116 is read, and a reproduction start address is determined. For example, the relative address of VOBU is referred to, the relative address is added to the address of VOBU of the beginning of the cell, and a reproduction start address is determined. If a reproduction start address is determined, as shown in Step S86, a read- out command will be taken out with the address to the driving part 32, and reproduction will be resumed for the VOBU as first VOBU like reproduction of the usual cell at Step S90. Same processing is performed as Step 104 having been equivalent to processing also in S34 from Step S22 shown in drawing 16, and already having been explained from Step S92 after this resumption.

Therefore, refer to S34 for the detailed explanation from Step S22 drawing 16 is indicated to be.

[0110]

[Effect of the Invention] As explained above, according to this invention,

since reproduction interruption information is described by the disk as an information recording medium for recording playback, even if a disk is extracted from a system, playback becomes possible following the recharge back.

[Translation done.]